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WEST EUROPE REPORT

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FINNISH RESEARCHERS PRODUCE HUMAN INTERFERON IN BACILLUS

Helsinki HUFVUDSTADSBLADET in Swedish 18 Mar 83 p 13

[Article by I. L.: "New Gene Technology; Bacillus Better Than Genus Coli"]

[Text] Researchers at Helsinki University are the first in the world to produce human interferon in two species of Bacillus bacteria with the help of gene technology. Microbiologist Ilkka Palva will receive his Ph.D. today with a doctoral thesis on the following subject: "Construction of a Bacillus Secretion Vector."

Gene technology has replaced what was previously called gene manipulation. This is the science which studies methods of moving genes from higher organisms to bacteria in order to make them produce a desired protein such as, for example, insulin or interferon. Bacteria of the coli species were primarily used. The drawback with these is that they do not secrete out the material from the cell. It must be retrieved from the cell, which results in difficult purification processes. Genus Bacillus, on the other hand, secretes what it produces.

Industrial?

This is an extremely simplified description. Suffice it to say, the result of the research for which Ilkka Palva will receive his Ph.D. is that it should become easier to produce protein, for example interferon, from the Bacillus genus. A few more years of research are necessary before the establishment of industrial production, the Ph.D. candidate says. His opinion is that Finland is too small to set up a production for domestic demand, and it is much too early to talk of any exports.

Ilkka Palva is careful to stress that he did not do the work alone. It was undertaken within the framework of the recombinant DNA research, financed by SITRA [expansion unknown], at Helsinki University. Incidentally, the university will soon inaugurate its facility for gene technology in Sockenbacka. Its interdisciplinary nature is evident from the fact that the facility does not belong to any university department, but falls directly under the university council. An agreement concerning recombinant DNA research for the period 1983-85, with a 1.4 million[-mark] grant, was concluded with Finland's Academy in December.

Ilkka Palva, born in 1949, is the facility's first doctoral candidate. He did the main part of his work in Helsinki but has studied in Paris and Zurich. His examiner comes from Paris, Dr S. D. Ehrlich. Chairman is Prof Veronica Sundman.

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FINNS WORLD LEADERS IN GENETIC ENGINEERING

Bacillus Subtilis Looks Promising

Helsinki HELSINGIN SANOMAT in Finnish 18 Mar 83 p 20

[Article by Jukka-Pekka Lappalainen, Ilkka Perasalo, and Risto Varteva: "Bacillus Subtilis Is a Promising Bacterium: Finnish Method Promotes Genetic Science"]

[Text] Genetic science is a strong word in the biological sciences around the world, through it one can produce interferon and other substances that were formerly inaccessible.

Industrial use of genetic engineering has required large sums of money; then can poor Finland keep up with developments?

It certainly can. The dissertation by Ilkka Palva entitled "Construction of a Bacillus Secretion Vector," which will be defended today at the University of Helsinki tells about this.

"Escherichia coli bacteria have been used almost exclusively for the production of proteins by microbes up to now, because it is the best known," says Ilkka Palva.

"But E. coli is not the most appropriate host in all its characteristics. For this reason we began to study Bacillus subtilis bacteria, and in this we are at the leading edge of development: No one else has yet published reports about secretion vectors made with it."

Purification a Difficulty

Nowadays in genetic engineering foreign genes are implanted into host bacteria, which then begin to produce the desired proteins. Afterwards, the proteins are separated from the other substances in as high a purity as required.

The difference between E. coli and Bacillus is that Bacillus yields its products more easily that E. coli. The difference in its behavior is due to cell structure.

"The protein produced by coli bacteria remains inside the cell," Palva explains. "Therefore the cell mass has to be broken down, but it is difficult to purify the desired protein from this mixture of various substances.

"But the Bacillus has only one cell membrane, and the secretion vector moves through it and separates the desired proteins directly into the culture medium. It is much easier to extract them in pure form from the culture medium than from a clump of E. coli cells."

Bacillus has not yet been used on an industrial scale, since studies are just beginning. But the method is so promising that many institutions specializing in genetic engineering are already in contact with the Finns.

Genetic Engineering Institute Starts Operation

At the beginning of April the Genetic Engineering Institute of the University of Helsinki will begin operation in Pitajanmaki. Research equipment for the institute will be obtained with the aid of the 1967 Finnish independence jubilee-year fund, also called Sitra.

Sitra has strongly assisted Finnish genetics in other ways. "Without Sitra, we would not yet have such broad research in genetics," Palva says in gratitude. "Through Sitra financing a sufficiently large group of researchers from various fields has been brought together."

Researchers from various fields are needed, because genetic engineering is typical group research: there are, among others, biochemists, virologists, microbiologists, and experts in genetics and biotenchology. This plurality also appears in the scientific literature: a typical report may have the names of a couple of dozen authors.

Patents are Part of the Picture

All industrially promising inventions are worth patenting, of course, and this is also done in genetic engineering. According to Palva, there is a difficulty, however, in that there is no clear experience in such a new field as to what can be patented and how broad a protection can be obtained: "The basic technology is really very simple, the question is mainly about patenting of applications."

"Patenting costs a lot, and additional money is spent because the process is not yet completed," says Palva. "No private person can afford such money. The money has come from Sitra."

Palva will not start predicting the industrial applications of the method based on Bacillus. At first the goal is to continue research for a couple of years, and then it can be seen how the method has developed in practice.

In principle, however, in addition to interferon, one could make by this method insulin, growth hormone, and various vaccines.

Genetic Engineering Applications

Helsinki HELSINGIN SANOMAT in Finnish 18 Mar 83 p 20

[Article by Jukka-Pekka Lappalainen, Ilkka Perasalo, and Risto Varteva; "If Jules Verne Were Alive...: Birth of Giant Mouse Opens New Vistas for Mankind"]

[Text] The transfer of the growth-hormone gene of a rat into a mouse was a trick that even genetic researchers a couple of years ago considered impossible. The development of a "giant mouse" reported last December is the most fascinating achievement of genetic engineering so far. It has been described as one of the great steps forward in science. It opens vistas into the future that even Jules Verne couldn't have predicted.

In principle it is not a long distance from a "giant mouse" to other "giants," including man.

But how will genetic engineering change the world? One can hardly find any scientists willing to predict. The most couragous, sharpest, and in some ways most accurate predictions have often been left for science-fiction writers.

But there are some brave optimists. One of them is Albert de la Chapelle, professor of hereditary science at the University of Helsinki: "Recombinant-DNA research will have the most practical benefit for the short range in medicine."

Even now certain hereditary diseases can be diagnosed significantly better with the help of genetic engineering.

Professor de la Chapelle refers to the most important hereditary diseases of mankind, such as thalassemia; there are estimated to be 200 million carriers. Several hundred thousand persons with this disease are born each year.

Carriers of the disease can now be found through genetic engineering.

"I think I am not exaggerating in believing that in a few years we will be able to diagnose diseases like hemophilia, perhaps muscular distrophy, and some difficult diseases of the nervous system," says de la Chapelle.

Genetic engineering has also been applied to diagnosis of communicable diseases. Concepts about many diseases may have to change completely. Innovations that affect our "disease panorama" are foreseen. Better diagnosis is one of them, vaccines another.

Professor Pirjo Makela of the National Health Laboratory says that DNA research in the area of vaccines will have the most profound effect on the health of mankind, and it offers a means of eradicating diseases in developing countries.

In her 100-year forecast Makela predicts that "malaria will have been conquered by vaccines produced through genetic engineering, and many other medical problems of developing countries will have been dealt with."

Prediction is Impossible

Ernst Palmen, chancellor and veterinarian, considers it obvious that the technology of recombinant-DNA will now grow rapidly. "In science generally, development proceeds at a dizzying pace after a great breakthrough."

Any other predictions are impossible, according to Palmen. Time will show what basic research will bring about and how knowledge can be applied.

Palmen reminds us of changes in knowledge about hereditary factors. "When I myself was a student, chromosomes were talked about and there was a theoretical concept called the gene. Now chromosomes are well known and genes are being manipulated."

Leevi Kaariainen, director of the Genetic Engineering Institute of the University of Helsinki and a practicing genetics researcher, reminds us that there are about a hundred thousand genes in [each of] the cells of humans and animals.

The complex and seemingly impossible joint working of a hundred thousand genes brings about all activities of life.

"The fact that a gene can now be extracted and implanted in the same or another cell has made it possible to study the regulation of genetic activity."

Applications of genetic engineering are not possible without basic research.

Knowledge about the structure of genes is increasing all the time. Every day the results of research on the structure of genes in bacteria, yeasts and animals are appearing.

Genetic engineering has established its own scientific journals and international periodicals.

There is a long road of research ahead, but in time the riddles of embryological development, cell differentiation and problems of cancer will probably be solved. These questions can now be approached experimentally by the methods of genetic engineering.

Also the evolution of species can be evaluated in quite a new way by studying the structures of the same genes in different creatures and organisms. In this way it will be possible to calculate rather precisely--though precision here means millions of years--when certain species separated from one another.

Very early it was noticed that there is a fundamental difference between the genes of bacteria and those of animals.

Through the study of the structure of genes such things as the origin and activity of our immune protection have been described. "From a few thousand genes, when they are suitable parts, we can build more than ten million different antibody molecules," says Kaariainen.

New possibilities for cancer research have opened up with the finding of cancer genes.

Recombinant-DNA technology has made it possible in principle to extract the gene that makes any protein whatever, and place it into a suitable bacterium to produce large amounts of medically or industrially important proteins.

Insulin produced by recombinant-DNA technology has already appeared on the market, and industrial production of interferon should not be very far away.

New Possibilities for Improving Animals

The "giant mouse" incident showed that the genes of animals can be placed in animal cells, even into a fertilized egg, and in that way into every cell of the organism. In principle there are no obstacles to animal improvement.

Animals have been improved before, of course. This has been done by nature and by man. But there is a possibility ahead for new and faster technology.

"But it is necessary to know precisely which genes are responsible for the particular characteristics we wish to transfer," Kaariainen reminds us. There is an enormous field of labor in this basic research.

Research Targets for a Long Time

Much hope is also being placed in genetic engineering for improvement of plants. There, too, basic research is needed in order to make use of technology.

Since at this moment only a ten-thousandth part of the whole capacity and structure of the heredity factors of animals and humans is known, the employment opportunities for recombinant-DNA research are guaranteed for centuries, unless research methods improve dramatically.

Research is just at the beginning of the road. It is undecided how one could achieve improvements based on the joint action of very many genes in plants, for example. The structure of genes is simply not understood, to say nothing of how they cooperate.

"A group of 10 genes is always more difficult than a system of one gene," Leevi Kaariainen says.

Nils Oker-Blom, virus researcher and rector of the University of Helsinki reminds us of the possibilities of genetic engineering in many other areas. One goal is the development of nitrogen-fixing bacteria.

"This appears often as a happy solution [achievable] in the next hundred years."

Visions of the future also include many kinds of pollution-destroying bacteria. The making of compost, an age-old way of handling waste by use of bacteria, may be aided by bacteria capable of destroying new pollutants.

But researchers are unable to predict when our cows will give two buckets of milk instead of the present one, when beef cattle will grow to twice their present size, when grain harvests will multiply, when the most important trees for the wood industry will grow with a swoosh like hybrid aspens to the size of mammoth pine trees, or when basketball teams will consist of boys three meters tall.

The fact is, the mouse event has opened up views of this kind as well.

"The mouse event was quite fantastic, not because a bigger mouse was born, but that the whole thing was even possible," says professor Albert de la Chapelle. "It was possible to transfer an active gene into a vertebrate."

In the Service of Good or Evil

It is perhaps fortunate for mankind that the breakthrough in recombinant-DNA research happened in the 1980s and that these tricks were not performed half a century ago.

Even though genetic engineering, like many other kinds of research, gives possibilities in principle for good and evil, researchers have a confident attitude toward the responsible application of the new knowledge.

Recombinant-DNA research is now controlled very strictly; detailed regulations set precise limits for science.

But if nevertheless...

Chancellor Palmen notes that genetic research does not require a large amount of space. It can be done even in a cellar. It is a question of small research targets.

If an atomic bomb can in principle be built by anyone, it is hardly possible that genetic engineering can be kept from dictators and terrorist groups, even with strict rules and control systems.

Respect for Life

Archbishop John Vikstrom connects the ethical problems of genetic engineering with the ethics of technology in general.

"Much has been said about the inviolability of man. One can also ask, shouldn't we speak also about the inviolability of nature?"

Vikstrom supposes that the inviolability of nature is becoming an ethical question "in a totally different way than yesterday."

"The qualitative difference is in the fact that it is possible to make some changes in the human body that go with that person to the grave and others that can be inherited. This is a clear distinction with ethical significance."

Vikstrom emphasizes the importance of exchanging information between the scientific community and society. "The scientific community can arouse unnecessary fears. If the scientific community is not sufficiently open, it can also arouse doubts."

"Knowledge is power, and no power should be uncontrollable. Society must learn what is happening in this area of science and what kinds of power are coming into being," says Vikstrom.

There has been much less discussion about genetic engineering in Finland than in many other countries.

Rector Oker-Blom has a calm attitude toward the heated debate that has gone on in the United States, for example.

"The only animal that would be worthwhile for crossing with humans is the horse, which is such a friendly animal...," Oker-Blom muses, well aware that the present times do not give us enough understanding for even such an innocent effort towards a form well known ever since antiquity.

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FRG SCIENTISTS STUDY GENE TRANSFER BY ELECTRIC SHOCK

Bonn DIE WELT in German 23 Apr 83 Supplement p IV

[Article by Walter Frese: "Gene Transfer by Electroshock: New Tool for Molecular Biology and Cell Research"]

[Text] By means of intermittent electric fields, foreign genetic material can be maneuvered into cells. Scientists of the Max Planck Institute for Biochemistry in Martinsried, near Munich, encountered this effect while doing so-called discontinuous field experiments, which permit extremely rapid processes in cell membranes to be observed. It turned out that discontinuous electric fields create short-term pore-like openings in cell membranes through which DNA-deoxyribonucleic acid, the substance which carries genetic information can penetrate into the interior of the cell. In addition, discontinuous electric fields also cause cells to blend together to form giant cells with several nuclei of various patterns. Both "side effects" of electric fields, gene transfer and cell fusion make the discontinuous field method a simple and promising tool for gene technology and cell research.

These phenomena are called "side effects" because the discontinuous field process originally had a very different purpose: to provide insight into complex elementary life processes which occur in the natural electric fields of every cell membrane.

Cell membranes fulfill a double function. On the one hand they protect the interior of the cell, and on the other hand they bring about and oversee metabolism between the cell and its environment. Both functions contribute to keeping the inner environment of the cell--to a certain extent, the composition of its "life juices"--stable, independently of external conditions, in so-called dynamic equilibrium. In addition, rapid electric nerve signals are transmitted through cell membranes.

Decisive for many of these functions is the membrane potential, a difference in electrical tension between the inner and outer surfaces of the membrane, which expresses itself as an electrical field. "This tension," explains Professer Eberhard Neumann, leader of the physical biochemistry working group at the Martinsried Max Planck Institute, "is 70,000ths of a volt on the average. This may seem small, but with an average membrane thickness of only 10 millionths of a millimeter, it corresponds to a field strength of 70,000 volts per centimeter, a respectably high voltage."

Now, an electrical field exerts a force on electrical charges. Thus all components of the membrane--proteins and lipids--to the extent that they carry unequally distributed charges or show dipole characteristics, are influenced in their position or structure by the strength and direction of the membrane field. Many biological processes in membranes occur against this physical background. Thus, for example, a nerve impulse represents an intermittent change in the membrane potential: this sudden change in voltage alters the local configuration of certain membrane components in such a way that, like the gates of a river lock, tiny channels in the membrane are opened for a short time; this in turn results in an exchange of ions such as sodium or potassium, or in the taking up or giving off of substances by the cell. In this sense, the cell membrane could be termed an "electrically controlled reaction space."

Neumann and his coworkers are attempting to deciphere in detail the regulation and direction of electrochemical membrane processes. Above all they wish to discover how individual components of the membrane behave under field changes, how they react mechanically and kinematically. The principle of these investigations is simple: membrane fragments with the required molecule complexes are isolated and exposed to an artificial electrical field, so that their reaction to changes in the membrane potential which has been simulated in this way can be analyzed. This sounds simple, but it requires a surprisingly large technical effort. The reason for this is that many of the electrically caused structural changes in membrane molecules occur extremely fast, some of them in a millionth or billionth of a second. In order to record such short-lived situations, to catch the reacting molecules "in flagranti delicto," the measurement apparatus must operate equally fast. This means that the change in the artificial membrane field must occur so fast that the change is past before the disturbed structures respond completely to it and arrive at a new equilibrium. Then--and only then--can the details of the reaction of the membrane components be followed clearly.

The Martinsried scientists have been able to set new standards in recent years in regard to the speed and sensitivity of field discontinuity measurements of this sort. They have managed, with the aid of a field apparatus which they improved, to lower the limit of time measurements to about a billionth of a second. Within this extremely short span of time a powerful electric field is generated in the apparatus's analyzer, the effect of which on the structure of the isolated membrane samples is then analyzed optically and by means of changes in electrical conductivity.

In the course of such experiments it was discovered in 1972 that field discontinuities not only alter the structure of particular functional elements of the membrane but also increase the permeability of cell membranes in general. It was only at this point that a practical byproduct of this research, which originally was not practically oriented, turned up--as an answer to the question of whether this effect could be used to maneuver foreign genetic materials into cells.

Research carried out in cooperation with the virus research section of the Martinsried Max Planck Institute confirmed this supposition. Mutant descendents of mouse cells which were missing the gene--the "blueprint"--for thymidine kinase, an essential enzyme, were used. Cells can't survive such defects when place in a particular nutrient medium, called "killer medium." However, if these mutants are placed in a solution containing foreign deoxyribonucleic acid (DNA) with the gene for thymidine kinase and then subjected to field discontinuities, they subsequently thrive in the killer medium--an indication that the cells subjected to the electric field have absorbed DNA from the solution and reacquired the gene for thymidine kinase, and thereby the ability to produce this enzyme themselves.

In spite of many as yet unanswered questions regarding its biochemical details, the "electroshock method" has several significant advantages over the usual procedures for DNA transfer. Since it is based on a general physical effect, it can in principle be applied to all cell types. In contrast, the biochemical methods used until now are limited to particular cell types.

The same advantages are present in another practical application of the field discontinuity approach which Neumann, together with Professor Guenther Gerisch and his cell biology section of the Martinsried Max Planck Institute, have developed. This application has to do with the fusion of cells: cells in direct contact with each other, in other words whose membranes touch, can be bused or merged together by field impulses. Neumann and Gerisch managed in this manner to fuse up to 50 cells, that is, to create a giant cell with 50 nuclei surrounded by a common membrane.

Since each of these nuclei is a control center which retains the genetic material of its original cell, interesting questions arise: what happens when a cell suddenly has several such command posts? Which nucleus will prevail in this competition and control the life machinery of the giant cell--especially when the nuclei come from cells of various types or from cells of the same type but at different stages of development?

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LACK OF ENGINEERS, TRADE DEFICIT HAMPER ELECTRONICS INDUSTRY

Paris ELECTRONIQUE ACTUALITES in French 1 Apr 83 pp 1,4

[Article by "D.L."]

[Text] In his first contact with the press the newly elected president of the FIEE sent the government an s.o.s., calling on it to take some serious steps to train more electronics engineers and technicians. "The shortage of engineers is a limiting factor in the growth of our electronics industry," he said, estimating the current shortfall at 500 engineers and 1,000 or 1,500 master technicians, and added that the industry's catch-up plan calls for an additional 1,000 engineers and some 3,000 more master technicians.

According to the new FIEE president, the shortage of cadres is a major obstacle to the advancement of French electronics industry abroad, hence the decline in foreign earnings within the profession. The trade balance for the electrical and electronics industries has watched its trade surplus plummet from 7 billion francs in 1981 to 700,000 in 1982 (for a total volume of business of 158 billion francs).

Despite the enthusiastic talk about the future of electronics, the FIEE finds to its chagrin that nothing was done in 1982 to increase the numbers of young people studying engineering in the schools. Worse yet, "Sup'Elec," [Ecole Superieure de l'Electronique], whose role as purveyor of skills and talent to the industry, does not even enjoy government status (it is owned by the SEE). The school is of course supported by the national education budget, but receives no regular funding. Result: Sup'Elec trains only 350 engineers per year, while it should be turning out twice that many to meet industry requirements.

FIEE has suggested ways to make engineers in 2 years out of new university graduates (such operations are contemplated with the universities of Nancy and Nantes). Similarly, the Federation has supported training for technicians in the IUTs and in participating in a pilot plan for alternative training in electronics (see our 11 Feb 83 issue). Even so, a real training policy, embraced by the government, should take over as quickly as feasible.

Commenting on the performance of the electric, electronics, and computer industries in 1982, M de Laage de Meux ventured the idea that the decline in our foreign trade over that year was "an accident due to excessive imports and to lower billing than anticipated," and adding: "the situation returned to something closer to normal beginning last July, and so we should in 1983 wind up with about half the 1981 surplus." Meanwhile, the FIEE looks for weak growth, if any, in 1983.

With 158 billion francs worth of business (61 billions from exports) our industries chalked up a 13.5-percent increase in value and a 6.5-percent increase in volume in 1982. Computers and software showed the sharpest growth (up 26 to 29 percent), followed by consumer goods (up 7 percent in volume) and intermediate goods. Investment goods, on the contrary, showed a 1.5-percent drop in billing. The decline in investments by private companies, both abroad and in France, as well as the further cutbacks in telecommunications and defense spending, explain this trend.

The sectors showing surpluses in foreign trade are heavy and medium electrical equipment (GIMEE), with an 8.5-billion surplus, professional electronics (7.5 billion), and cables (1 billion). The deficit sectors are mass-consumption lines (with more than 8 billion in deficit), data processing (5.5 billion), office equipment (3 billion), components (2 billion with faster-growing deficits), and household appliances (1.7 billion).

Strong imports of computer-related materials were one of the year's major developments in 1982. M Sallebert, FIEE's managing director, recalled that in 1979 data processing showed a surplus, that in 1980 it showed a slight deficit, that in 1981 it showed a strong deficit, and that it 1982 its deficit was heavy. An inevitable pattern, alas!

Despite these reverses, FIEE does not plan to take the easy way out with "Buy French!" campaigns or lobbying for protectionist measures. On the contrary, it is campaigning among its members to expand their operations abroad. The effort is aimed primarily at the United States (with a 12-billion-franc surplus including half our computer and software deficit), Japan (with a 6-billion-franc surplus, two thirds of it our mass-market lines deficit), and the FRG, with which we have a 45-billion-franc trade deficit, mainly in household appliances and passive components.

6182

CSO: 3698/293

FIRST EUROPEAN SOFTWARE-ENGINEERING TRAINING CENTER

Paris ELECTRONIQUE ACTUALITES in French 1 Apr 83 p 1

[Article by Philippe Marel]

[Text] Valbonne. -- Until now, only American universities offered courses in software engineering. With the establishment of CERICS (Center for education and research in computer sciences, communications, and systems) at Sofia-Antipolis on CERAM's premises, that European inadequacy will be remedied.

The presence at its opening ceremonies on 25 March of this year of Messers Stern, Lions, and Garrigues, presidents of CMB and CII-HB, of INRIA, and of ADI, respectively, illustrates an exemplary pattern of cooperation among industry, education, and research and highlights the importance of the stakes to the French software industry.

Placing CERICS at Sofia-Antipolis, according to M Stern, is "an important event at the European level."

While until now, students who wanted to get training in software engineering had to cross the Atlantic and enroll in courses at MIT or Berkeley, or else specialize within the giant SSCIs, more or less "on the job," and bit by bit, now they will have places here in France and in Europe to complete their post-graduate training.

Software engineering is fast becoming , for France's software industry -- ranked second in the world with a turnover of 12.7 billion francs in 1982 -- the spearhead in a new phase of its development or, at the very least, a consolidation of its positions.

Software engineering, which can be defined as a mode of planning in a complex environment, aims at producing different kinds of tools that can create software on an industrial scale (compilers, tools for aid to development, etc.). The idea is to reverse the rise in software costs which, according to M Garrigues, "is increasingly prohibitive for users, and the French industry must find a way to do this if it wants to keep its position."

A European Master of Science Degree

CERICS will be open to top-notch students (graduates of the big engineering schools or the university's third cycle), who can pursue a 9-month course of specialized studies with 1,500 hours of course work organized by groups around specific projects, whose completion may lead to a transfer to industry.

The first study cycle will begin next fall and will take in 30 students (chosen from among anywhere from 500 to 900 candidates). The second year, CERICS hopes to have room for 40 students, and, later on, an average of 70 per year, provided it can find enough available instructors.

At the conclusion of the study cycle, the students will receive a diploma equivalent to the American MS degree.

Research and Industry

The students will be working with the very latest equipment, thanks to what has been called exemplary cooperation among research, in dustry, and education. The starting investment by the Nice Chamber of Commerce (which founded and runs CERAM), came to 2.2 million francs, and it was backed with 0.6 billion francs in a grant from ADI.

CII-HB's contribution will consist of providing a DPS Multics 60 system, linked with other Multics to be installed in the INRIA premises at Valbonne, whose opening is slated for next October. When it is all in place, there will be a terminal available to each student.

The CII-HB contribution doesn't stop there, though, since the builder plans, as part of its ongoing training program, to offer scholarships to a third of CERICS students, ten of them in the first year.

More broadly, and in addition to this commendable collaboration among industry (CII-BH), research (INRIA), and education (CERAM), M Garrigues pointed out that this undertaking aims at filling the long-standing gaps in the French training system and at performing that vital service to further the goals of the electronics industry.

6182

CSO: 3698/293

REPORT CRITICIZES FRENCH ELECTRONICS PROGRAM

Johannesburg THE STAR in English 11 May 83 p 10M

[Text] Judging by the number of government speeches devoted to promoting new technology since the Socialists came to power in France, President Francois Mitterrand looks likely to have the word "electronics" engraved on his heart, the Financial Times reports from Paris.

But a report written for Prime Minister Pierre Mauroy by a senior official in the industry ministry has severely criticised key aspects of the government's information technology programme.

In his report which, partly because of its controversial nature, has not been officially published, the official suggests that France must take bold steps if it is to become, as the government hopes, the world's third most important electronics power (after the US and Japan) by the end of the decade.

NEGATIVE

He calls for the multitude of government agencies charged with promoting computer technology to be reorganised under a new Information Technologies Commission.

And he hits out in particular at the preferential treatment given by successive French administrations to domestic computer companies. Mainly negative consequences have followed, he says.

The report paints a gloomy picture of the penetration of computers in France compared with other countries.

In the area of automated manufacturing, the official says France has a "worrying lag" compared not only with the US and Japan but also with European countries like Britain, Sweden, Norway and Italy.

In information technology, despite the priority given to the sector by successive governments, the situation is judged to be "far" from satisfactory.

SERIOUS LAG

France's share of computers installed in Europe has fallen from 20,7 percent in 1978 to 19,5 percent, and could drop to 17 percent by 1985, behind Britain and West Germany.

France's position in areas where equipment is more widely distributed because of its lower cost — such as automated office technology, and micro-computing — is more favourable, but the figures still show a serious lag.

In 1981, the report says, France accounted for only 13 percent of European deliveries of automated office equipment against 33 percent in West Germany. Of total micro-computers installed in Europe, the French share (by value) is only 15,3 percent, against 24,1 percent in West Germany and 28,7 percent in Britain.

Even in sectors where France has achieved an international lead — for example the electronic telephone directories now being introduced experimentally in certain regions — there is plenty to criticise.

DELAYS

Electronic directories installed in a pilot scheme at Velizy, near Paris, are seriously under-used (the screens are interrogated no more than about 1,5 times a week on average). The official adds: "One can only be astonished at the poor exploitation of these systems by badly educated and badly organised operators who often make use only of a very small part of the equipment's potential."

The lags accumulated in all key areas could have "dramatic" consequences. Already, the report says, French manufacturing sectors competitiveness has been substantially reduced because of delays in introducing automated equipment.

Together with the roughly 30 other public or quasi-public institutions working on introducing computers into schools, homes and businesses, the four main government agencies charged with promoting information technology could produce a "socio-technocratic bureaucracy" which is "incoherent, uselessly complicated and paralysing".

STATE BUYER

The report's most severe criticism of government programmes surrounds official buying policies.

It says the entire government electronics plan — built around the "filiere" concept of across the board action in individual inter-related areas — relies too much on the power of the state monopoly buyer.

He decries preferential purchasing policies for computers — started in 1967, long before the advent of the Socialist government — as "negative" and ill-adapted to new technologies.

Successive government programmes which have given priority to official purchasing from the national computer company, CII Honeywell Bull, have led to 63 percent of the administration's computers being French-made.

CSO: 3698/316

CII-HB TO RECEIVE TWO BILLION FRANCS FROM GOVERNMENT

Paris ZERO UN INFORMATIQUE HEBDO in French 17 Jan 83 p 1

/Article by Gerard Schmitt/

/Text/ CII-Honeywell Bull will be receiving government credit for research (requested by Jacques Stern when the company's new organizational chart was presented--see issue No. 729 of 01 HEBDO) in an amount "that could run as high as 500 million francs in 1983." This French manufacturer will also receive one and a half billion francs in capital grants this year. This is what Jean-Pierre Chevenement said when the initial statistics gathered by the observatory of the public industrial sector, established last September, were published. "These preliminary results still do not represent exactly what I would like to do," the minister of research and industry acknowledged. Confined for the time being to the 11 enterprises under the DGI (including CGE, CII-HB and Thomson, but not Matra, for the electronics sector) and based on data for 1981 and the first half of 1982, as reported by the enterprises themselves, this preliminary balance sheet is essentially "a description of the initial situation." Next July the "honors list" for the industrial public sector will cover all of 1982 and will include a detailed list of activities, supplementary data (R & D costs, debt, etc.), and a breakdown of profits and losses by sector. For the first half of 1982, CII-HB thus shows the following results, already known in part: a turnover of 3.4 billion francs, representing an increase of 20 percent but a net loss of 500 million francs, and a 30 percent decline in investments. In view of these figures, it is easy to understand the appeal made by the company a month ago. The government heard it and has made a noteworthy effort. But will it be enough?

9805
CSO: 3698/281

THOMSON-CSF FLEXIBLE WORKSHOP FOR INTEGRATED CIRCUITS

Paris L'USINE NOUVELLE in French 10 Mar 83 pp 94-95

[Article by Jacques Antoine]

[Text] To improve quality, decrease the time required and costs, increase production flexibility, and improve working conditions. This was the challenge faced in a printed circuits workshop of Thomson-CSF, a challenge met by using a complex computerized system developed by TITN [New Technologies Information Processing]: this is the first French flexible workshop for assembly and wiring.

The objectives set by Thomson-CSF's RCM [Radar, control-measures, missiles] department for the production of printed circuits in its plant at Pessac have been achieved for the past few months through the use of the real-time operation and monitoring of a flexible workshop for assembly and wiring. This workshop, the first of its kind, was developed by Thomson-TITN, a subsidiary of the Thomson group.

This is a very particular context: production of a prototype nature, either multi-unit or limited production (average batches of 10 to 50 pieces). But the production is done using standard machines designed for large-scale production at high rates of speed: computer-operated sequencing machine, NC machines for the automatic insertion of components, test benches.

The first objective: to improve quality. "Automation makes errors systematic, so they are easily found, contrary to human errors, which are generally random in nature," explains Jean-Paul Perrier, in charge of industrial information processing and organization at the aircraft systems division of Thomson-CSF. Moreover, "it decreases the number of handling operations for components, and makes it possible to test them at the time of insertion." As for the reduction in production time, over 90 percent of which is used for storage time and inter-operations transit, "we can immediately see the value of a real time sequencing system and workshop designed for the logical linkage of operations."

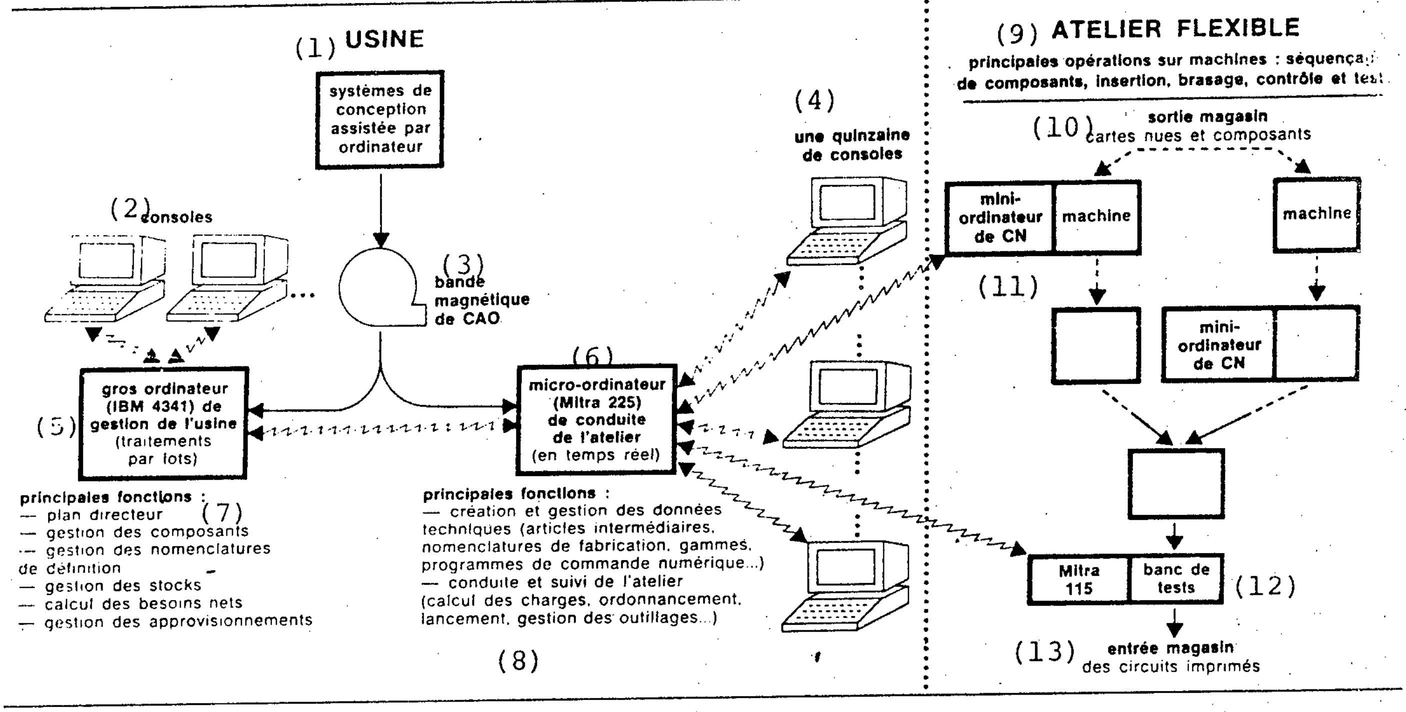
The "costs" objective. The great variety of components (3,000 axial, 500 integrated DIL'S circuits), the reduced size of the batches, and consequently the many operations of loading and unloading of bare cards and components, changing of tools, adjustments...all that leads to a "machine utilization ratio which barely exceeds 20 percent with a traditional arrangement. So the operation of the machines must be optimized in order to minimize transit time."

A Guiding Idea: Four Levels of Computers

The "flexibility" objective is necessary if the workshop is to be made capable of adapting to production programming variables, to technical modifications in printed circuits (on the average, one modification per month and per product), and to the availability of the raw materials and the machines. "To do this, it is necessary to integrate the management of this workshop in the more general system of production management of this RCM department."

These guidelines led to the formation of work specifications, based on the operator's requirements. If this workshop were to be created starting from the beginning, it is still no less true that the construction of a coherent decentralized system--from design down to the entry of the printed circuits into a shop ready for use--would require three conditions: a computer-aided production management system (of the MRP type), a research office equipped with CAO [Computer-Aided Design] facilities, and test methods equipped with simulation facilities in order to generate test programs (software for control and test .enches).

With these three requisites met, the TITN could get to work. The first phase: work specifications for the computer systems (division and evaluation of functions, function architecture, and related programs). The guiding idea was to allocate to different computers jobs with different processing requirements, but within one communications structure. "You have four levels of computers," explains Guy Renaudot, a Thomson-TITN engineer. On the first level are CAO [Computer-Assisted Design] systems which provide technical and geometric data on the products on magnetic tape. On the second level is an IBM computer used for standard industrial management and processing by batches." This computer handles article descriptions and definition links or it may manage stocks and supplies, according to needs. "The third level, which we developed essentially from the preceding level is a mini-computer which, in real time, of course, will operate the workshop. It processes both technical and management data."



Thomson-CSF's flexible workshop for the assembly and wiring of printed circuits covers all the production operations: from the time the components and bare cards leave the shops until the printed circuits, wired and tested, enter the shops where they are to be used.

Key:
1. Plant: computer-assisted design systems
2. Consoles
3. CAO magnetic tape
4. About 15 consoles
5. Large computer (IBM 4341) for plant management (processing in batches)
6. Micro-computer (Mitra 225) to run the shop in real time

7. Principal functions;
   a. masterplan
   b. management of components
   c. management of definition nomenclatures
   d. stock management
   e. calculation of net needs
   f. supply management

8. Principal functions:
   a. creation and management of technical data (intermediate articles, production nomenclatures, lines, NC programs, etc.)
   b. operation and monitoring of the shop (calculation of workloads, sequencing, initiation, management of tools, etc.)

9. Flexible workshop: principal operations on machines: sequencing of components, insertion, soldering, control, and testing
10. Output from supply plant: bare cards and components
11. NC mini-computer
12. test bench
13. Input to plant where printed circuits are to be used

The technical data include production nomenclatures (definition nomenclatures in addition to articles and linkages used in the shop) and insertion data from the CAO which are then introduced in these new nomenclatures. The data also include lines created locally based on standard model lines and computer listings of tools, materials, instruction cards, etc. There are also NC programs, which may be either temporary (depending on the sequencing and insertion production orders), or constant (insertion of axial components). These data also include operational data (historic, potential, etc.). All this data requires real-time processing done locally on the workshop's computer (Mitra 225), and dialogues with the management computer (IBM equipped with a CICS teleprocessing monitor with a 3270 protocol).

The shop management data cover essentially all the operational logistics: calculation of workloads, arrangement, sequencing, initiation, management of repeat operations, management of stock movements and of missing items, of tools, and above all, optimization of the sequencer. "This is the machine with the greatest impact on the operation of the others," explains Guy Renaudot. "Of course its operation may not be optimal now, but it does respond well to the user's requirement, of r_ducing handling operations." Jean-Paul Perrier says that, considering the limited capacity of the sequencer (160 spools) and the number of different components (about 3,000), "arrangement according to date criteria is no longer adequate. Depending on the initial load status of the sequencer, it is necessary to produce sequenced tapes in the order resulting in the minimum number of handling operations for tape components, while still respecting schedules and target dates." All these real-time calculations handled on consoles in the shop require an ongoing dialogue between computers, in this case to transmit manufacturing orders, status reports on missing items, etc.

The fourth level of computers is almost transparent. These are NC minicomputers, integrated in a standard way by the computer manufacturers. "On this level," explains Guy Renaudot, "nothing is fundamentally modified in terms of the equipment. These minicomputers become black boxes to receive data and programs from the Mitra 225 used for the general management of the shop."

So the system appears to be complex. However, its operation and use are easy. "The users have standard consoles with a guide on the screen, menus, and relatively simple language. A little bit of training is enough," adds Guy Renaudot.

Security of operation has obviously been taken into consideration in this system. "As soon as you have a data-base management system, you then have an underlying part that gives you the desired security and confidentiality: publication of daily status reports, automatic repeat operation procedures, code-controled access, etc." And what happens if the Mitra should break down? "Computer redundancy is not justified when we put in all the software procedures for resumption of work. The system makes it possible to work without the shop computer for several hours for, after batch processing in the evening, it loads the NC black box diskettes for 2 working days, and the manual positions then receive the published lists." As for maintenance, the TITN obviously is responsible, but the user can handle some things, adding annex functions and other applications, in addition to maintaining the application software.

Programming: a Specialty of TITN

There are 100,000 lines of programming in Cobol, suitable for transactional procedures, 820 screen-management programs, 150 interrogation-aid programs. These are the specialties of the TITN staff, which is in charge of the project! The budget involved is nearly 70 men per month (one man per month = 25,000 to 45,000 francs). "The most important feature is related to transaction management," says Guy Renaudot. "The main problems in dealing with computers are related to communications between computers: 3270 interface under Temis between the IBM and the Mitra 225, in order to obtain the requisite transparency, and Mitra 225-PDP interface for the machines. The latter is provided by the manufacturer of the insertion machines, but very often problems do arise in this area."

Equipment and Software Selected

Each NC machine has its own computer (a minicomputer of the PDP 11 type). The test benches are also operated by minicomputers (Mitra 115 made by the SEMS). The minicomputer used to operate the shop, a SEMS Mitra 225, has a central unit of 512 Kwords (it is oversized), a card reader (300 characters per minute), a printer (300 lines per minute), two disc units (50 Mo), a magnetic tape unit with a winding device, video terminals, and 15,550 printers (180 characters per second). The final computer receives a multijob multifunction MMT2 monitor made by the SEMS, while local liaisons and the data base management software (Temis software) are made by TITN.

7679
CSO: 3698/270

ELECTRONICS

BRIEFS

CII-HB, ICL, SIEMENS JOINT RESEARCH--Paris. The three biggest European computer groups, CII-Honeywell Bull (France), ICL (Great Britain), and Siemens (Federal Republic of Germany), have begun discussions to develop a joint research structure, industrial sources in Paris and Munich have reported. Contacts are being made, but it is not possible to say when or even if they will produce results, report the same sources about these talks. This would be the second European attempt to create a joint computer venture, after the failure of UNIDA, which included CCI, Philips, and Siemens, in 1976. This cooperation could take the form of a small joint venture that could gradually grow if it were satisfactory to all the parties involved. In the first phase, a center with about 50 people could do research on a new generation of more powerful, more flexible, and more intelligent computers. CII-HB has refused to confirm this report, even though its PDG [Chief Executive Officer], Jacques Stern, has on several occasions said that the group would "systematically" seek agreements with foreign firms, with priority given to other European companies. He had also stated that any possible cooperation should not compromise the independence of the firms involved. [Text] [Paris AFP SCIENCES in French 24 Mar 83 p 8] 7679

FINNISH MICROCOMPUTER EXPORT EFFORT--Turku--The largest Finnish enterprises in the electronics field, Oy Nokia Ab Elektroniikka and Salora Oy signed an agreement last Friday for cooperation in microcomputers. The agreement is a framework intended as the basis for long-term cooperation. Market cooperation is foreseen, however, already during the current year, both domestically and in the export market. Salora will start selling microcomputers this spring already. Specifically these will be so-called "personal computers," microcomputers suitable for use at home or in small businesses. Microcomputers, the sale of which has been notable also in Europe, have become a much-discussed topic in the field of electronics, and sales are increasing rapidly. In the opinion of Nokia and Salora, microcomputers offer good growth possibilities for the Finnish electronics industry. Through market cooperation an effort will be made to secure a leading position domestically and to broaden exports to Scandinavia and elsewhere in Europe. Nokia is a leading Nordic computer manufacturer, and Salora is the largest Nordic manufacturer of color televisions, with a strong domestic sales network and efficient sales connection throughout Europe. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 18 Mar 83 p 31] 9611

CSO: 3698/259

NEW MATERIAL WILL REPLACE ASBESTOS, SILICA, CERAMIC FIBERS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 26 Apr 83 p 5

[Article: "Clay and Glass Fibers as Substitute for Asbestos"]

[Text] Frankfurt, 25 April--According to a report in the NEW SCIENTIST of 24 March, a new material is coming on the market which can replace asbestos, silica and ceramic fibers. A mat of connected glass fibers is produced by coating individual fibers with a clay mineral having a plateform structure. The layer is only 0.001 micrometers thick. The material is produced by ICI, a British chemical firm. The material retains its physical and dimensional stability at a temperature of 1,000 degrees C and a specified tensile strength at 750 degrees C. The treated mat has the trade name Fortress T. It has a basic density of 50 g/square meter and a treated weight of 50 to 100 g/square meter. Fortress T is the first of a series of similarly treated glass-fiber products.

ICI has developed in Runcorn a type of "molecular scalpel" for delaminating minerals such as vermiculite, the clay material in the case at hand. An ion exchange process produces an aqueous sludge of platelets with molecular dimensions. The starting point of the process is the crystallographic structure of the mineral which consists basically of silicon, oxygen, metallic atoms and molecular water arrayed in layers.

ICI has not commented on the nature of these platelets, however, they have reported that the chemical treatment can be tailored to accommodate the structure and end conditions of the particular mineral. Thus the process works very well with kaolin clays for example. It has been determined that the platelets are enormously wide and long in comparison to their thickness. Such dimensions allow strong molecular forces to act over short distances conferring outstanding coating and film-forming properties. Consequently, every fiber dipped into the sludge attracts the platelets which collect around and encase the fiber.

A series of physical effects contribute to vermiculite's ability to protect glass at high temperatures. The envelope impedes heat penetration and conducts it away along the planes of the platelets. The coating preserves a certain amount of the mat's strength when the glass softens and melts. When the glass resolidifies, Fortress T gets back a part of its original strength.

9160
CSO: 3698/283

PLANS FOR SWEDISH RESEARCH PARK IN LUND TAKE SHAPE

Stockholm DAGENS NYHETER in Swedish 16 Apr 83 p 9

[Article by Bo Engzell: "Research Park in Lund Will Recreate Scania"]

[Text] Malmö, Friday [15 Apr] (Scania office of DAGENS NYHETER) --Scania is facing a gigantic reorganization of its job market. Thousands of new jobs will be created in new high-technology electronic and chemical industry as a result of the new research park in Lund which has now taken definite shape, according to DAGENS NYHETER's information.

The time for the building of Europe's biggest chemistry center in Lund will be moved up.

In addition, the research park in Lund itself will employ 1,500 highly qualified researchers, at a low estimate, in a little over 5 years. The first researchers will arrive this fall.

"No less important are the industries that are 'offshoots' from the research park," Governor Nils Hörjel tells DAGENS NYHETER. "They are firms for production of the researchers' new products. That production will be carried on at various places in Scania. If the researchers are successful there can be several thousand new jobs before the end of the 1980's."

Nils Hörjel, who is chairman of SUN [Cooperation Between University and Industry], took the initiative for the research park.

Big Companies

It is already evident now that the present research park, which the pharmaceutical giants Gambro and Fraco are greatly expanding, will be joined by several big companies. First, Ericsson Radio Systems (formerly LM Ericsson's SRA [Swedish Radio Company]), which will have 1,000 researchers there before the end of the 1980's (Hörjel is president of the company), Philips, and Ericsson Information Systems.

Some 15 companies will participate in the chemistry center that is being built at a cost of 35 million kronor, according to Nils Hörjel.

Among others, Bofors, Perstorp, Berol-Kemi, Alfa-Laval, and the Swedish Dairies Association.

"We are also counting on big Scanian food industries," Hörjel adds.

It was the research parks in California and England, which are also connected with universities and college-level institutes, that served as models for Lund.

"In Japan they are going to build a whole research city," Hörjel says. "We are counting on Scania's getting industries as an offshoot from Lund. Scania has a favorable climate. It is cheaper to build in Scania than in other parts of Sweden, and the climate also makes heating costs lower."

Big industry in Scania has been hard hit by shutdowns in recent years. Rubber industries, paint, and building material have dropped to half the number of employees. The textile and clothing industry has been almost wiped out.

The first on the schedule for the research park are 60 engineers, this fall, for Ericsson Radio Systems, of which Hörjel is president. In only a few years there will be several hundred. Later the figure will rise to 1,000, according to the managing director of the company.

Many other industries besides those mentioned above have expressed interest in the research park in Lund.

"It will be quite a different Scania in the future as far as the job market is concerned," says Nils Hörjel. "We are not giving up."

8815
CSO: 3698/299

BRITISH LEYLAND, HONDA SIGN JOINT PRODUCTION AGREEMENT

Paris AUTO-INDUSTRIES in French 6 Apr 83 pp 3-4

[Text] On April 6 in Tokyo British Leyland and Honda signed a technical cooperation agreement for the joint production of a top of the line car that will be put on the market in 1985, it was learned today at the headquarters of the British firm.

This agreement, which, it was noted, marks "a great step forward," should pave the way for the conclusion of another agreement between now and the end of this year which will give the project a permanent "green light."

The agreement divides the responsibilities of each of the two partners in the design of the model and the future management of the project. It also sets up a joint technical committee responsible for determining the origin of the components that will be used in manufacturing the vehicle and for finalizing the construction and marketing procedures. This committee's report will be used as the basis for the permanent agreement.

This so-called "design and development" agreement confirms that Honda and Austin Rover (British Leyland) will separately produce "distinctive models" which will leave each of the two partners with its own individual identity. As agreed when this project was adopted in November 1981, the two companies are sharing equal responsibility for the design of the vehicle.

Under the terms of the initial project, the two partners must market their own model separately. In addition to its own model, however, Honda will assemble the Austin Rover model on its assembly line in Japan and British Leyland will sell this on its Asian market and, vice versa, in addition to its own model, British Leyland will produce the Honda model in Great Britain which the Japanese firm itself will sell in Europe and the United States.

9720
CSO:3698/278

COMPUTER-AIDED DESIGN SAID TO BE ADVANCED AT VOLVO

Stockholm DAGENS NYHETER in Swedish 12 Apr 83 p 28

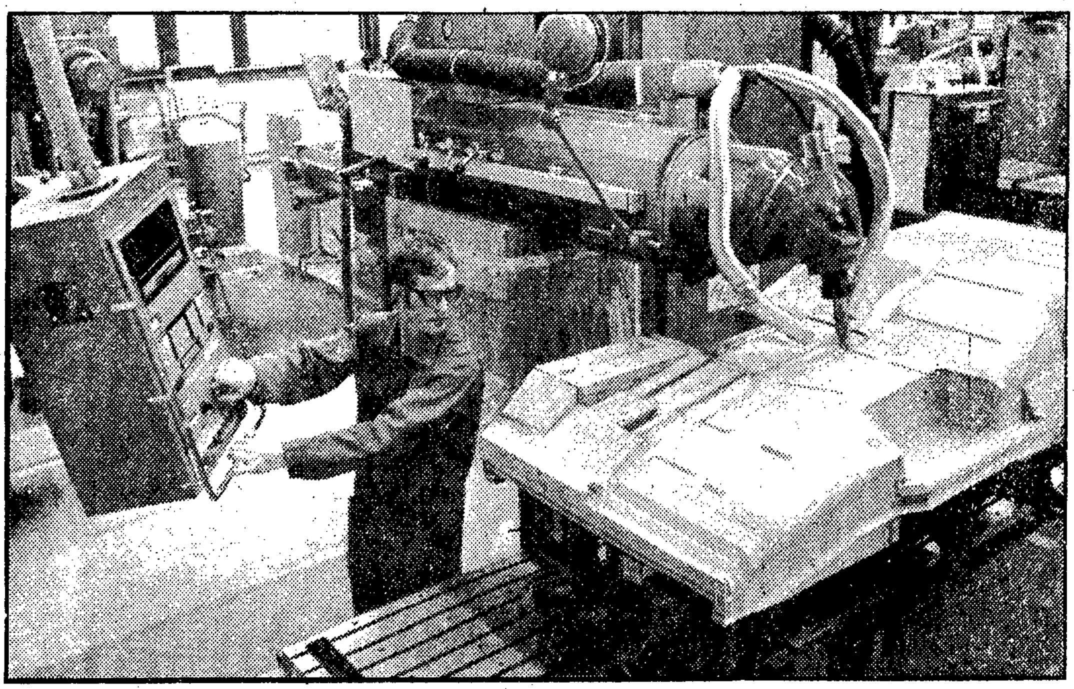
[Article by Anna-Maria Hagerfors]

> [Text] When the Volvo of the future is created it will be computers that do the drafting and sculpting--even though the prototype is still made by hand in clay. Volvo is far ahead in the computer revolution that awaits the whole engineering industry. The development time for a car model has decreased from 5 years to a little over 3 years. The designers' drawing boards are disappearing. How will the computers affect their creative work?
>
> He waves the magic wand across the screen and suddenly a circle appears... and another... and now a geometrical figure like a starfish develops.. and then it becomes three-dimensional... and now it has turned so that we see it from an entirely different angle...
>
> "The computer is showing that we were not accurate enough when we were drawing by hand. It rejects our handmade drawings as 'IMPOSSIBLE.'"

It was the designer Magnus Sundemo of the motor division that was sitting at the screen conjuring and talking. An experiment with CAD (computer-aided design) began there in February 1981. In June 1982 it was accepted for good. The actual software used is called CADAM.

There are still rolls of drawings, files, and drawing boards. The conversion to computers is gradual.

The terminal where Magnus Sundemo was playing with the geometric starfish is one of the links in a chain of data-processing systems that is completely changing the whole process of the work of improving and developing new car models. It includes, e.g., computers that make patterns for automobile upholstery with the least possible waste of fabric, and computer-programmed milling cutters that can cope with the most complexly shaped model surfaces.



In the pattern shop computer-controlled cutters do the advanced job of shaping surfaces directly by the designer's computer-stored sketch. Per-Arne Lennartsson is supervising.

Far Advanced

Competition on the world market has caused Volvo to be far ahead in this process that is going to revolutionize the whole engineering industry. In 1979 there were 60-odd CAD systems in Sweden. By 1990 they are expected to increase to a thousnad, according to calculations of the data and electronics committee. (In many cases CAD is combined with CAM, which means data-supported manufacturing.)

"Drafting and design are creative work. How is the process affected when the computer comes into the picture?"

"The creative environment is frightfully important. The person has to do a good job first; then the computer will be a tool. The conversion procedure must not disturb the creative process; that must not be rushed. Poor work must not be done here for the sake of speed," says Kurt Nilsson, technical director.

"For that reason we still have drawing boards, and so far few designers make use of computers, although many have access to one."

The advantages, according to the management of the firm, are as follows:

- The designers do a more effective job when the computer takes a hand in the routine work.

- The recorded knowledge can be systematized and reused.

● Those who are interested in creative solutions can quickly retrieve 10 alternatives and choose the best.

● Formerly it was quite laborious to redo drawings, to erase and change. Now the computer does that quickly, and the old drawing is still available for comparison.

'Psychological'

"It is psychologically important," says Sven Holmberg, who is in charge of computer development for engineering design. "Formerly a designer could be asked for a drawing in the morning, and then one got into a long squabble of half a day because it is painful to begin erasing and destroying what one has already put work into. We all remember how awful it was when the professor at Chalmers came and drew a big, thick line across one's neat drawing. Now it is possible to make changes without destroying what has already been done."

DAGENS NYHETER: What about the pleasure in drawing? It is just as much fun when the computer does it?

Sven Holmberg: There are some that think the pleasure is more important than perfection of the results. And that get enthusiastic when the computer is down.

DAGENS NYHETER: There are great gains in time. Does that mean that many draftsmen and designers will be unemployed in the future?

Kurt Nilsson: I do not believe it will affect employment if we continue to do well on the market. The gain in time can be used to improve the cars and to develop more variants. Anyway, practically every designer is specialized and hence irreplaceable.

Stressed

The disadvantages with sitting at a computer and drawing and designing are that one is isolated and under stress, to judge by experience elsewhere in Sweden. The computer responds so quickly that one forces oneself into a high tempo. Do the motor designers at Volvo have the same experience?

"No, at first the problem was rather the reverse. The computer fooled around and we had lots of time to respond. Then you come under enormous stress," says Magnus Sundemo. "But it is clear that it is getting to be intense.

"We have had no experience with isolation. For us in the experimental group, on the contrary, the computer has been a thing in common. So far, therefore, we spend only a little part of the day at the screen."

During the introduction of the CADAM system the SIF club [Swedish Industrial Salaried Employees' Association] was very active. There were real conflicts. Now both problems and advantages have been worked out, so that other professional groups can benefit from the experience and mistakes made at Volvo.

Problems:

● The decision on the system (the CADAM software) had already been made when the trade association came into the picture.

- The trade association had very little knowledge at the beginning.

- The experimental work was sabotaged because the foremen did not allow the designers to devote themselves to the computer sufficiently. There were many uncertainties about who was to be responsible for the introduction, set the requirements, and allocate resources.

- The supplier, IBM, caused three difficulties: The system did not function right technically at first. The training was beneath all criticism. The manual was almost unusable, and was in English besides.

But most of this was straightened out by negotiations, and now the SIF club can record the positive side.

Advantages:

- None of the designers would care to be without the CADAM system today.

- The plant management took a positive attitude toward the union's cooperation.

- The systems engineers have stood up for the users.

- The training got quite good eventually.

"But there are still many question marks," says Christina Gustafson, of the SIF club.

"The designers are working at the terminals only for short spells. How will it be when they are sitting there all the time? That is when the stress will come.

"And what use will be made of the gains in time? Will the designers get the extra time? Or will there be fewer employed?"

Jonny Tedenfors, SIF's computer expert in Stockholm, says:

"Computer support is coming in everywhere now, much faster than anybody thought for. About 100,000 of our members are involved."

SIF is giving high priority to computer questions now, both in the form of courses and in the form of plans for alternative models, to develop data systems that the users can influence from the beginning.

"We will not take the position that what the machine can do, it shall do," says Jonny Tedenfors.

"The machine shall simply do what man needs help with."

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FRG: STUDY OF LOW-TEMPERATURE HYDRIDES FOR AUTOMOBILE FUEL

Frankfurt/Main FRANKFURTER ALLGEMEINE in German 27 Apr 83 p 29

[Article by Rainer Floehl: "Hydrogen: A Manysided Energy Source. Risk-free Storage with Metallic Hydrides. Use as a Fuel Tank and Heat Reservoir"]

[Text] Of all the chemical fuels hydrogen has the highest energy density. Moreover, the reaction of hydrogen with oxygen, in comparison with other combustion processes, is environmentally safe, since it produces only water (apart from secondary reactions with nitrogen in the air) and no carbon monoxide. Hydrogen can also be obtained in almost unlimited amouts from the breakdown of water. A number of obstacles, however, stand in the way of the exploitation of these advantages of widely-used "hydrogen technology." On the one hand, the production of hydrogen requires large quantities of energy; on the other hand, the transport and storage of hydrogen pose difficulties. While production costs have scarcely been reduced despite wide-ranging efforts, significant progress in the use of metallic hydrides to store hydrogen has been achieved. In the Federal Republic, primarily Daimler-Benz in Stuttgart and the Max Planck Institute for Coal Research in Muelheim/Ruhr, as well as the nuclear research facility in Jeulich and Muenster University, took part in these developments.

The metallic hydrides, as compounds of metals and hydrogen are termed, are to a certain extent a byproduct of reactor development. In the search for materials to slow neutrons, researchers at the Brookhaven Laboratories in the United States investigated heat-resistant compounds with high hydrogen density. In the late sixties they discovered titanium-iron hydride. This material, however, was not especially stable. It was therefore proposed to use it for hydrogen storage. Whereupon in Europe Philips in Eindhoven developed a magnetic material which "attracted" hydrogen.

It soon proved to be the case that the metallic hydrides had an additional interesting and industrially promising characteristic: they are ideal heat accumulators. This characteristic of the metallic hydrides results from the fact that, when charged with hydrogen, in other words during the combining reaction, heat is given off, whereas during the release of hydrogen from the hydride heat is absorbed. This means that the metallic hydrides can be used to store heat, since the charging and discharging can be repeated at will.

The real advantage of the metallic hydrides, however, is that larger, technically interesting hydrogen storage densities can be achieved with them, and with extraordinary reliablity, than with cooled or even compressed hydrogen. This makes hydrogen appear promising as a fuel for automobiles. To be sure a metallic-hydride tank is about 20 times heavier and 5 times larger than a gasoline tank, but the metallic hydrides are superior by a factor of 5 to 10 to lead batteries for the storage of electrical energy. Thus the range of a hydrogen-powered car is greater than that of an electrically powered car, but still shorter than that of gasoline or diesel vehicles.

Since hydrogen is easily obtained by decomposing water by means of heat or electric current, hydrogen is primarily an interesting alternative to electic propulsion. Thus Daimler-Benz, with support from the Federal Ministry for Research and Technology, has in the last 10 years developed hydrogen propulsion to the extent that, like the already successfully tested City Bus, a practical test with passenger automobiles of the T series and light transport vehicles is to begin this year in Berlin.

In Germany hydride development was pioneered by Daimler-Benz in Stuttgart, where many metallic hydrides were synthesized and tested for their practical applicability as hydrogen accumulators. The most important factor here is that the hydrogen content be as high as possible and that the taking up and giving off of hydrogen be sufficiently fast. Finally the entire process must be repeatable as often as required. The costs of the metals and alloys must be as low as possible.

These requirements were largely fulfilled by the low-temperature hydries developed by Daimler-Benz. These compounds have proved to be advantageous, even indispensable, because they give off hydrogen under normal pressure conditions at temperatures of -25° C. The heat required to release the hydrogen is taken from the air, which is thereby further cooled. The low-C temperature hydrides supply sufficient hydrogen in winter as well. To be sure, the storage density is small in comparison with ordinary fuels. On theoretical grounds the low-temperature metallic hydrides can take up at most 2.5 percent by weight of hydrogen.

With a multiphase alloy using titanium, zirconium, chromium, manganese, vandium and iron, Daimler-Benz produced a hydride that, with 2 percent by weight of hydrogen, approaches this limit. Of course, these alloys are relatively expensive and as yet difficult to hydrogenize. Charging the alloys with hydrogen requires extreme reaction conditions, and the reaction speeds improve only after several chargings and dischargings, which increase production costs.

Many of the shortcomings of low-temperature hydrides were overcome by the synthesis of high-temperature magnesium hydrides. These compounds can absorb a maximum of 8 percent by weight of hydrogen. In addition the magnesium hydrides, as Borislav Bogdanovic of the Max Planck Institute for Coal Research in Mulheim/Ruhr discovered, are extremely easy to produce. They require no preliminary processing and are therefore immediately usable. To be sure, they give off appreciable quantities of hydrogen only at temperatures above 250°C. Bogdanovic succeeded in synthesizing magnesium hydrides, which until had been difficult to obtain magnesium and hydrogen under mild conditions. This discovery is the result of pure basic research in the area of catalysis and continues the tradition of Franz Fischer, Karl Ziegler and Guenther Wilke in Muelheim.

The addition of small amounts of anthracene to magnesium suspended in a solvent yields transient, highly reactive soluble, anthracene magnesium. Replaced with dissolved chromium or titanium catalysts, the magnesium anthracene reacts easily with gaseous hydrogen, yielding magnesium hydride and giving off anthracene. The anthracene, like chromium or titanium, then reenters the catalytic cycle. This is how magnesium hydride is produced by the kilogram in technical schools. Because of its high reactivity, magnesium hydride is good for more than just storing hydrogen; it is also a versatile raw material for organic and inorganic syntheses and catalysts as well as for metallic alloys and intermetallic compounds. Magnesium hydrides may even simplfy the production of the classical Ziegler catalysts for synthesizing plastics and increase their efficiency.

The magnesium hydrides are extraordinarily stable as hydrogen accumulators. They have been charged and discharged 200 times without loss of activity, using industrial, i.e., not especially pure, hydrogen. Charging is completed in a few hours, even at atmospheric pressure. The thermal energy released during this process can sometimes be used for heating purposes. With magnesium hydride, which, at 7 percent, achieves virtually the maximum accumulation, the development of the metallic hydrides as hydrogen and heat accumulators reaches a certain upper limit.

The situation is entirely different, however, with regard to application. In this area many interesting development have occurred. Hydrogen propulsion is still in its early stages. The metallic hydrides make possible an energy package which offers significant advantages. Since the high-temperature hydrides give off hydrogen only at temperatures above 250° C, they must be heated. In an automobile this can be done only through the use of the engine exhaust. But since this exhaust is not present in sufficient quantity and is not available under all operating conditions, by itself it can release only 40 percent of the required fuel, even at maximum engine performance. Low-temperature hydrides, which are necessary in any case for cold starting, must supply the rest. The situation is entirely different under local traffic conditions. In "stop and go" driving, for example, the temperatures of the engine exhaust of a hydrogen engine is almost always under 300° C, so that almost no hydrogen can be removed from the high-temperature accumulator. This means that high-temperature hydrides can contribute practially nothing to the hydrogen supply of the engine in urban use, where hydrogen propulsion is especially attractive due to its environmental harmlessness.

The decisive factor for the economy of the hydride system is that the heat used to release hydrogen from the metallic hydrides can be recovered at night during their recharging and therefore rationally used. In addition, low and high-temperature hydrides are usable together, in different proportions, as heat pumps, air conditioners or refrigerators by transfering hydrogen from one accumulator to the other. This can also happen independently of the automobile in appropriately designed units. Hydrogen hydrides can even be used as compressors which generate pressure without movable parts. The first test model of a hydride starter battery has already been built. All of these developments are still in the research stage. A practical application is thus not foreseen in the immediate future.

The metallic hydrides undoubtedly contribute to making it easier to work with hydrogen, which is not entirely without danger. In any case, the high-temperature hydrides give off hydrogen only at higher temperatures. The low-temperature accumulators cool so fast after an accident that only a little hydrogen escapes. This technology is thus even safer than the traditional gasoline tank. The metallic hydride accumlators also no longer pose difficulties. Even reactive magnesium hydride can now be produced, as experience in Muelbeim shows, in a form that does not ignite upon exposure to air.

A satisfactory solution to the problem of the removal of heat given off during charging of the accumulators has likewise been found as a result of developmental work at Daimler-Benz, Thyssen and Mannesmann. Through the use of aluminum and copper powder conductivity, which decreases with increasing hydrogen content, has been improved sufficiently so that the acculators take up and give off heat adequately. When necessary water can be used for cooling purposes, as is being done in "fast filling" experiments in Berlin.

International developmental work has confirmed that combustion engines can be adapted to hydrogen propulsion. The hydrogen-air mixture requires external ignition, that is, an Otto engine. Of course the performance of such engines is only 70 percent of that of conventional engines, due to the limited hydrogen density. The ignition of the hydrogen-air mixture occurs very easily, and so hot areas in the cylinder cause ignition failures, making frequent engine and ignition system replacements necessary. Additional water injection, however, has solved this problem. The cooling achieved in this way also limits the formation of nitrogen oxides, so that the environmental advantages of hydrogen propulsion are not lost.

Hydrogen is undoubtedly an inexhaustible energy source for the future. But it is uncertain when it will be able to compete with present energy sources or even replace them. The decisive factor in this regard will be whether water can be broken down sufficiently cheaply using electric current from sunlight or heat from nuclear reactors. Only then will the infrastucture develop which is required for its distribution and use on a large scale. That hydrogen technology will be mastered is demonstrated by experience in the Ruhr region, where a reliably functioning hydrogen-power grid has existed for a long time. The metallic hydride accumulators, however, have decisvely expanded the possibilities of hydrogen technology.

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TRANSPORTATION

BRIEFS

GOOD START FOR PEUGEOT 205--Paris, 31 March (AFP). The new Peugeot 205 "is meeting with undeniable success with the French customer," AUTOMOBILES PEUGEOT said on 31 March. Daily orders are now averaging 1,100 cars in France and over 40 cars in Switzerland. In the Mulhouse plant which is manufacturing all the 205's, the daily production rate will exceed 450 units in March and 530 in April, and then 630 in May to reach 760 to 800 by July. Orders for the "205" are currently divided equally between the 1,124 cubic cm. model (43 percent) and the 1,360 cubic cm. one (44 percent), with 10 percent of them for the GT sports model. The "Macao" metallic brown heads the lists of body colors, followed by "antelope" beige and "cascade" metallic blue. Among the first customers are the republican security companies which required 60 white Peugeot 205's. With 5,137 cars registered during the first 2 weeks of March, the 205 is cornering 6 percent of the French market, closely followed by the 305 with 5.8 percent, according to AUTOMOBILES PEUGEOT. [Text] [Paris AUTO-INDUSTRIES in French 1 Apr 83 p 1] 9805

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